

A. Abstract

The reason our SeaPerch is unique and different in its own way is because the SeaPerch's front is slanted on a 45 degree angle. This is different from the base SeaPerch which is a more square shape. We also scaled the SeaPerch down 15 percent from the base size. We have a scoop on the front of the SeaPerch to help with the challenge. The reason we slanted the front on a 45 degree angle is because out of the four years and four SeaPerches³ that design did the best out of all of them. We scaled down the SeaPerch by 15 percent by first calculating the measurements from the manual using a formula. Second, we did the cutting with our tools with pieces of pipe. We thought about our moderator's words, *measure twice, cut once*. Third, we put the SeaPerch together.

We made the scoop by getting two pieces of pipe, one was two inches in diameter and the other was a half inch in diameter cut to nine inches. We took the two inch pipe cut it in half and melted the sides. We then took the two inch pipe and then drilled and bolted it to the half inch piece. We put two pieces of pool noodle on the SeaPerch to add buoyancy.² After we built the SeaPerch we tested out our design and it worked out pretty well but we made some changes and wire tied the pool noodles so it will stay on the Perch.

B. Task Overview

The SeaPerch will have to go through many tasks the perch will have to complete during competition. In the challenges the perch has to sprint to a 5 inch target, set off a beacon to set off a light, close a gate on a vault, raise a flag, guide through a bubbler, navigate through a horizontal tunnel, slide a wheel up an inclined pipe past a set mark on that pipe, and the last challenge is to move away from the wheel and push a red course completion button.

We looked at the obstacles and in the second obstacle, the challenge is to move three feet through a narrow passageway. The steep edges will slow down the SeaPerch. We decided to scale down the perch 15% to make the perch smaller, so that it would go through the hoops easier. The smaller design will make the navigation of the SeaPerch more efficient. Being able to pilot the SeaPerch with its smaller design will make it easier to go in and out of the hoops. We also added a "scoop" because in the fourth challenge the perch has to grab a small plastic bottle from the floating ring. The bottle must be pushed over or pulled below the top of the rings.

C. Design Approach

When deciding on how we should build the 2020 SeaPerch we looked at past perches and we based our body the SMTPerch from 2018. Our team scaled the original perch down by 15% to make it move faster and we changed the front of the perch to complete the task assigned for this year. We made the front look like an elephant trunk with a shovel on it for the challenge where you have to pick up water bottles (trash). When deciding on how the front should be we had some members on our team wanted a net on the front to catch the trash, and others wanted a PVC hoop made of elbows and couplings to catch the trash.

We decided on an elephant-style trunk because we thought that it would be the most efficient way of catching the trash. The net didn't work because we couldn't find a good way to attach it to the perch and we found that the hoop idea had a big flaw. The hoop didn't have grip and the water bottles would slip right out. When we thought we had the solution having the PVC pipe as our elephant trunk and the 2 " PVC pipe as the scoop it ended up sinking the SeaPerch to the bottom of the pool.

The most creative aspect of our Perch was the elephant trunk that we tried to attach to the SeaPerch in order to pick up the bottles for the challenge. So we decided on the elephant trunk because it was the most convenient way to pick up the bottles. It worked out well, but it was the weight distribution that made it bad because it was too heavy for the perch to return to the surface of the pool.

D. Experimental Results

When we were experimenting with our SeaPerch for the first time at the pool, movement was going pretty well until the pool noodles floated off the SeaPerch. We scooped the pool noodles up using a pool net. We got the SeaPerch out by pulling the tether cable up. During the test session we fixed this by using wire ties the pool noodles to the SeaPerch. After we did that, the SeaPerch did everything we needed it to do. It went up, it went down, it went left, it went right, it went backwards, and it went forwards. Though we have a little bit of trouble going up, I think it was just the 12 feet of water pressuring the SeaPerch down.

The perch also wasn't balanced when we added our "trunk" to the SeaPerch meaning when we went down it stayed down and we had to tether it back up. ¹ We will be making a new design in time for our next testing. Our new design is a pipe that has a bolt on it to push the water bottle where we want it to go. The old design we made by getting a piece of pipe and another piece of pipe making a trunk that looked like a shovel. We messed up that a couple times. Our team thought the new design will weigh less than the trunk design.

Overall movement is good, but we haven't tested out picking the water bottle up yet. We think this year's design worked better than last year's because last year's design had problems with stability. Last year we weren't able to test in the pool but this year we found that there is a pool available close to school. The next testing will be on February 27th.

E. Reflection & Next Steps

We think that this design combines a successful shape from two years ago with a smaller footprint enabling us to travel the courses at a higher rate of speed with better control. Using the pool has given us confidence in our success this season.

Before competition in three weeks, we will need to make the scoop shorter and weigh less. We are going to take off the shovel part and replace it with a screw. We need to glue it together and we have to trim off the sharp edges. Also, on February 27th we will go and test it.

We think by doing these things we can improve our control of the perch so that it will be able to rise and fall. We hope that we will have our best finish ever in 2020.

F. Acknowledgements

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G. References

¹Mata, F., & Vore, L. (2016). The Bull v3. Retrieved February 12, 2020, from http://www.seaperch.org/action/document/download?document_id=637

²PhillySeaPerch. (2011, October 7). Retrieved February 12, 2020, from <https://www.youtube.com/watch?v=WvgEAuPMi58>

³Results. (n.d.). Retrieved February 12, 2020, from <http://www.phillynavalstem.com/results.html>

⁴SeaPerch Ninja Warrior. (2019, November 27). Retrieved February 12, 2020, from http://www.phillynavalstem.com/uploads/7/5/2/1/75215467/sp_mission_document_for_2020_sm_rev2a.pdf